Cowbird Concentrations at Livestock Corrals in Grand Canyon National Park

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Abstract. Brown-headed cowbirds (*Molothrus ater*) at Grand Canyon National Park parasitize broods of many neotropical migrants including the southwestern willow flycatcher (*Empidonax traillii extimus*). We conducted surveys from 16 May through 28 July 1993 for brown-headed cowbirds at horse and mule corrals at five sites in the Grand Canyon, noting presence, abundance, sex, and foraging habits of cowbirds. Brown-headed cowbirds were detected at three of five pack stations where they foraged on grain, hay, mule dung, and insects. Cowbird numbers were lowest in the morning (before 1000 h) and increased thereafter. Brown-headed cowbirds are known to spend mornings in breeding areas and concentrate at foraging centers during midday. Corrals along the rim are providing important foraging centers for cowbirds and may be allowing these cowbirds to brood parasitize nests of other bird species in local forest and riparian areas.

Key words: Brood parasitism, brown-headed cowbird, monitoring, neotropical migrants.

The brown-headed cowbird (*Molothrus ater*) is a small passerine bird found throughout most of the United States and southern Canada. It is one of only three obligate brood parasites in North America (Brittingham and Temple 1983). Brood parasitism occurs when one species (the parasite) lays its eggs in the nest of another species (the host). The host species incubates the egg and raises the young of the parasite.

Before the arrival of European settlers, the cowbird was largely confined to the grasslands of the midcontinent. The cowbird followed grazing animals and ate the insects they stirred up (Wilcove et al. 1986). By the late 1800's, cowbirds were apparently widespread but not abundant in eastern North America and were found primarily in cultivated areas (Brittingham and Temple 1983).

The range of the brown-headed cowbird continued to increase in association with agricultural development and urbanization, and numbers still seem to be increasing in the West (Robinson et al. 1993).

Brown-headed cowbirds lay their eggs early in the day—usually before sunrise (Scott 1991). Female cowbirds usually lay 14–16 eggs per nesting season but in captivity are capable of laying up to 77 eggs in a season (Jackson and Roby 1992; Holford and Roby 1993). The incubation period of cowbirds is usually shorter (11–12 days) than the incubation period of the host, giving the cowbird nestling a distinct advantage over the host species nestlings (Friedmann 1963). Cowbird nestlings develop faster and demand more food and attention from the host parents (Friedmann 1929; Ortega and Cruz 1991).

Brown-headed cowbirds typically demonstrate a pattern of daily movement between separate foraging and breeding areas. Radio-tracking of cowbirds in the eastern Sierra Nevada of California showed that females and males spent mornings in host-rich habitat such as riparian zones and then commuted 2–7 km in the late morning and afternoon to one or more prime feeding sites such as horse corrals and pack stations (Rothstein et al. 1984).

Cowbirds regularly parasitize nests along the Colorado River corridor in the Grand Canyon—often nests of rare or declining species. For example, nest parasitism of southwestern willow flycatchers (*Empidonax traillii extimus*) is well documented (Brown 1988; Sogge et al. 1993*[1]). Cowbird parasitism affects willow flycatcher populations through reduced nesting success, reduced productivity, and delayed successful fledging of young (Sanders and Flett 1989; Whitfield 1990; Harris 1991; Sogge et al. 1993*). Nests of many other species of neotropical migrants, including Bell's vireos (*Vireo bellii*), yellow warblers (*Dendroica petechia*), and yellow-breasted chats (*Icteria virens*), were parasitized in the park (Brown et al. 1987; Johnson and Sogge 1993*).

The Grand Canyon National Park management and the park concessionaire (Fred Harvey Co.) maintain horse and mule corrals at five sites in the Grand Canyon. As demonstrated in the Sierra Nevada, such stations may provide foraging centers for brown-headed cowbirds (Rothstein et al. 1984; Beedy and Granholm 1985; Gains 1988). Brown et al. (1987) provide anecdotal records of brown-headed cowbirds foraging at park corrals. The food sources could attract cowbirds that might parasitize bird nests in adjacent areas and along the river

[1]Asterisk indicates unpublished material.

corridor (<10 km away). Grand Canyon National Park resources management staff requested that we develop a monitoring program to determine if park corrals were serving as foraging centers for brown-headed cowbirds. We designed the project to determine abundance and foraging activity of brown-headed cowbirds at the livestock corrals.

Methods

The project was coordinated by the Cooperative Park Studies Unit at Northern Arizona University (CPSU/NAU; currently the National Biological Service, Colorado Plateau Research Station). Surveyors included personnel from the CPSU/NAU and the National Park Service Grand Canyon Division of Resources Management. We conducted surveys at four sites along the south rim of the Grand Canyon (referred to as rim sites): Grand Canyon Village corral, Grand Canyon landfill, Yaqui Point corral, and Sunset Drive mule and horse corral (Fig. 1). The Phantom Ranch corral located along the river corridor was also surveyed weekly, and two surveys were conducted at two north-rim mule corrals.

Brown-headed cowbirds were detected by sight and song. We conducted surveys at least once per week from 16 May through 28 July 1993. Survey times varied between 0600 and 1600 h and were staggered each week to arrive at each major site at varying times throughout the day. Surveys began on the hour and lasted for 40 min.

Every 10 min throughout each survey period, we recorded the number, sex, and foraging behavior of the cowbirds observed. We noted the specific foraging within the site, and what the cowbirds were consuming (e.g., grain, dung, insects).

To determine the general abundance and distribution of brown-headed cowbirds in riparian areas along the Colorado River corridor, we summarized the cowbird data collected during CPSU/NAU-coordinated southwestern willow flycatcher and breeding bird surveys in 1992 and 1993 (Sogge and Tibbitts 1992*; Sogge et al. 1993*). These data included the location (by river mile), date, and time and the number, sex, and age of each cowbird observed during surveys of willow flycatcher and other breeding birds.

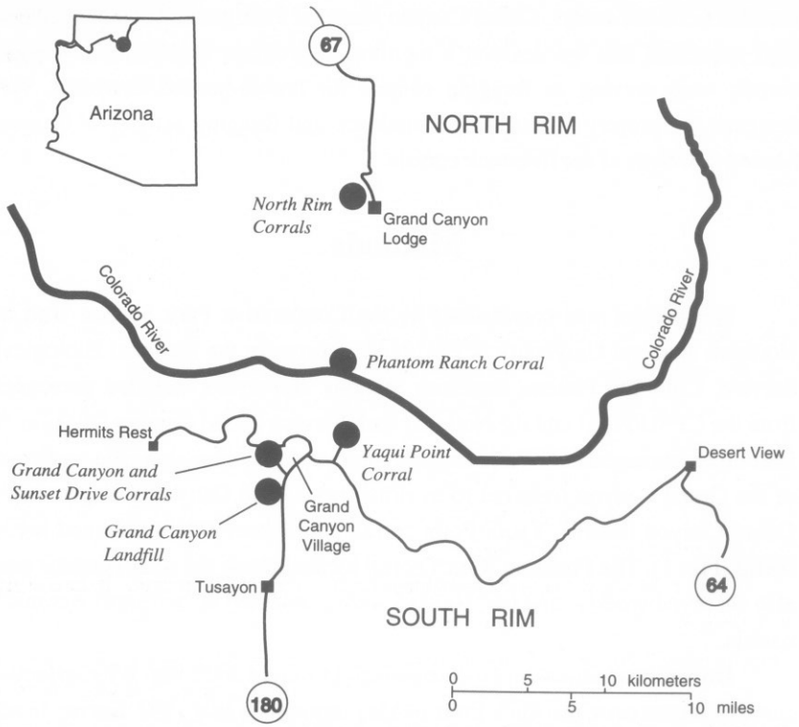

Fig. 1. Brown-head cowbird (*Molothrus ater*) survey sites (●) in Grand Canyon National Park.

Results

We conducted 64 surveys (Table 1) and made 449 observations of brown-headed cowbirds at the Grand Canyon Village, Yaqui Point, and Sunset Drive corrals. Some of the individuals probably were detected in more than one survey. No cowbirds were detected at Phantom Ranch, the Grand Canyon landfill, or the North Rim corral. At the three sites where they were observed, cowbirds foraged on feed grain, mule dung, insects, and other materials. Occasionally, cowbirds rested in trees or structures near the corrals, or males were seen courting females.

Where brown-headed cowbirds were observed in 35 surveys, we detected significantly more males than females ($n_m = 268$, $n_f = 167$, $\bar{x}_m = 7.65$, $SD_m = 4.85$, $\bar{x}_f = 4.8$, $SD_f = 3.4$, $P = 0.001$). The ratio of males to females was 1.6:1. We detected 14 immature (young-of-the-year) cowbirds.

Table 1. Summary of 1993 brown-headed cowbird (*Molothrus ater*) surveys at livestock corrals in Grand Canyon National Park (GRCA).

Survey	GRCA Village	Yaqui Point	GRCA landfill	Phantom Ranch	North rim	Sunset Drive
Number	16	16	16	7	6	3
Total hours	10.6	10.6	10.6	4.6	4.0	2.0

We recorded the most observations of cowbirds at Grand Canyon Village corral, followed by Yaqui Point (Table 2). The difference in cowbird detections between these two sites, however, was not significant. Sunset Drive and the north rim corrals were not surveyed until late July; cowbirds were detected at Sunset Drive but not at the north rim.

Juvenile brown-headed cowbirds first appeared at corrals in late July. Cowbird abundance was maintained throughout the survey period, with a slight (but insignificant) decline in numbers later in the season (Fig. 2).

Cowbird numbers varied by time of day. Numbers were lowest in early morning (0600–0900 h) then increased after 0900 h (Fig. 3). The daily pattern remained constant through all 3 months of surveys.

We found 117 records of brown-headed cowbird sightings along the Colorado River corridor during the southwestern willow flycatcher and breeding bird surveys in 1992–93. These sightings included 135 males, 78 females, 60 unknown sex or age, and 6 juveniles. Two possible male bronzed cowbirds (*Molothrus aeneus*) were noted in 1992. Cowbirds were detected throughout the

Table 2. Number of brown-headed cowbirds (*Molothrus ater*) observed per 40-min survey.[a]

Cowbirds	GRCA[b] Village	Yaqui Point	Sunset Drive	GRCA landfill	Phantom Ranch	North rim
Observed	13.8 ± 8.1	11.7 ± 6.9	10.7 ± 3.2	0	0	0
Foraging	11.2 ± 6.7	8.9 ± 5.3	10.3 ± 3.1	0	0	0

[a]Numbers given mean ±1 standard deviation.
[b]GRCA = Grand Canyon.

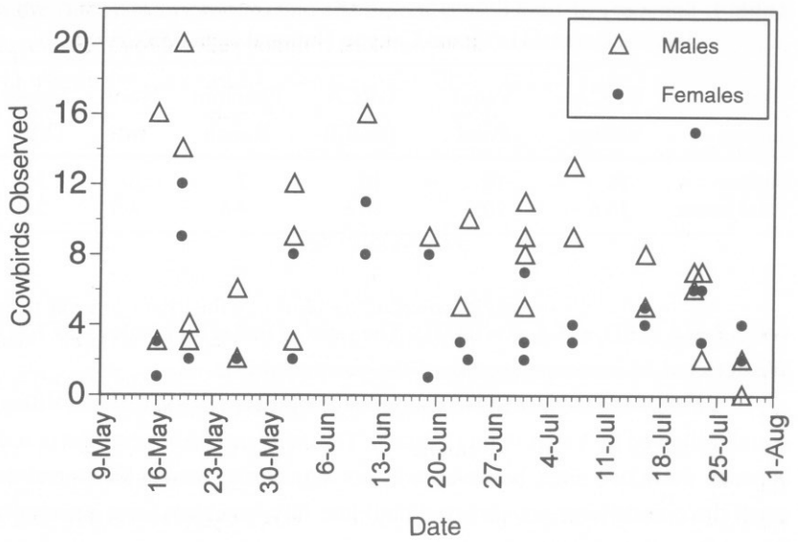

Fig. 2. The number of male (*triangles*) and female (*circles*) brown-headed cowbirds (*Molothrus ater*) detected, by survey date, at livestock corrals along the south rim of Grand Canyon National Park.

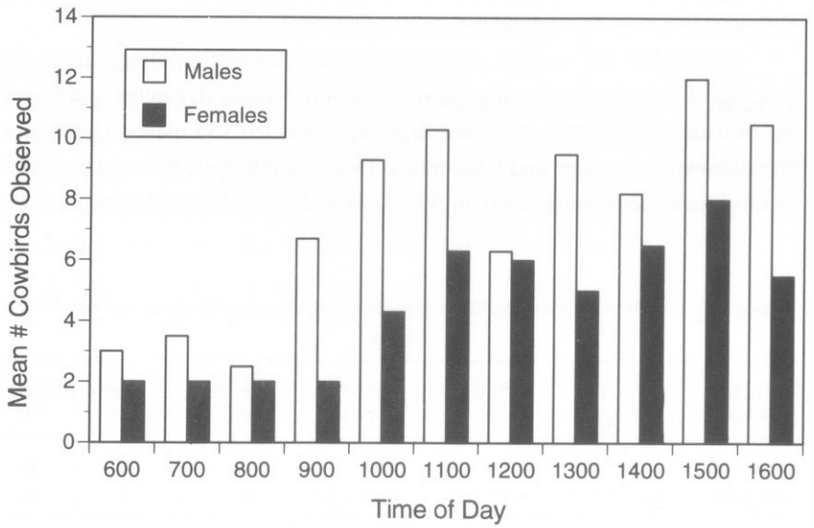

Fig. 3. The mean number of male (*white bars*) and female (*shaded bars*) brown-headed cowbirds (*Molothrus ater*) detected each hour during different hours of the day at corrals along the south rim of Grand Canyon National Park.

entire river corridor in Grand Canyon. In addition, we found records of cowbird eggs in nests of Bell's vireos, yellow warblers, common yellowthroats (*Geothlypis trichas*), yellow-breasted chats, and blue grosbeaks (*Guiraca caerulea*). We observed fledgling cowbirds being fed by adult yellow-breasted chats, yellow warblers, and southwestern willow flycatchers.

Discussion

We found brown-headed cowbirds at three of the five sites surveyed (Yaqui Point, Grand Canyon Village, and Sunset Point). At these sites, cowbirds are using corrals as foraging centers. Each corral provided food, water, and presence of stock animals, all important attractants for cowbirds.

At the three foraging centers, we noted significantly more males than females, a situation common with this species (Robinson et al. 1993). The extra males were usually immature and unmated 1-year-old birds that arrive later in the season (Wetmore 1920). Friedmann (1929) also observed males outnumbering females, with a ratio of 3:2, similar to the 3.4:2 ratio that we found.

The largest numbers of actively foraging brown-headed cowbirds were observed at Grand Canyon Village and Yaqui Point corrals. We were unable to determine why these two corrals were the most frequented. These corrals are the largest, are used consistently for horses, and relatively large amounts of cowbird food are always present as attractants (Glahn and Otis 1986).

Contrary to our original expectations, no brown-headed cowbirds were detected at the Grand Canyon landfill. The mule manure deposited at the landfill is a potential source of food for cowbirds, but it is spread throughout the landfill and buried. Burying the manure makes the potential food source inaccessible to cowbirds, thus eliminating cowbird concentration.

Cowbirds were absent from Phantom Ranch corral. We do not know why, particularly given historic concentrations at this site (Brown et al. 1987). Mules at Phantom Ranch are fed the same items as mules on the rim (R. Clayton, Fred Harvey Co., personal communication), thus availability of differing foods is not a factor. Other factors such as presence of hikers or extreme environmental conditions (e.g., heat) at the site may play a role.

Cowbirds were not detected during several opportunistic surveys conducted at the concession and park corrals on the north rim. Mules at these corrals are provided the same food as at south rim corrals; therefore, availability of food

is not responsible for the absence of cowbirds. In the Sierra Nevada of California, cowbirds are uncommon above 2,440–2,590 m (Gaines 1988), thus the high elevation of the north rim (2,680 m) corrals may inhibit cowbird use.

Cowbird numbers varied throughout the day but were lowest during the early mornings when cowbirds are known to frequent riparian and woodland areas where females parasitize host nests. The greatest number of cowbirds was detected between 1100 and 1400 h (Fig. 3). Rothstein et al. (1984) observed similar patterns.

The abundant and widespread cowbird sightings noted along the river corridor reflect the general magnitude of cowbird parasitism. Some cowbirds could move between the river corridor and the corrals, a distance of less than 10 km at the river's nearest point (cowbirds commuted 2–7 km daily in the Sierra Nevada [Rothstein et al. 1984] and are capable of moving greater distances [S. I. Rothstein, personal communication]). Cowbird parasitism of locally breeding neotropical migrant birds is pervasive, not only along the river but in virtually every habitat within the park (Brown et. al 1987). In addition to the warbler species parasitized in our study, cowbirds also parasitize mountain chickadees (*Parus gambeli*), blue-gray gnatcatchers (*Polioptila caerulea*), and black-throated gray warblers (*Dendroica nigrescens*; Brown et al. 1987).

Reduced productivity associated with cowbird nest parasitism may have detrimental effects on bird communities within Grand Canyon. Loss of productivity for extremely rare species, such as the proposed-endangered southwestern willow flycatcher, can have devastating effects. For example, all three willow flycatcher nests found in the park in 1993 were parasitized by brown-headed cowbirds, and all three nests failed to produce fledgling flycatchers. One pair did successfully rear a cowbird chick (Sogge et al. 1993*).

Nest parasitism by cowbirds may reduce the productivity of many of the neotropical migrant bird species found in the park and may be responsible for the decline of rare species such as the southwestern willow flycatcher. The conservation, protection, and management of avian resources is of concern to managers of Grand Canyon National Park. The park provides breeding areas for a variety of avian species, including many neotropical migratory birds. Parasitism by brown-headed cowbirds is a leading cause of decline of many neotropical migrant birds species (Mayfield 1977; Brittingham and Temple 1983).

General and specific resource-protection mandates exist that support control of cowbirds to reduce effects on bird species within the park. We recommend active management of cowbirds through continued monitoring,

population reduction, and research using radiotelemetry to determine movement of individuals within the park.

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